Patent Application of

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for

TITLE: RECUMBENT QUADRIMANUAL FORWARD-ROWING DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS Not Applicable

FEDERALLY SPONSORED RESEARCH Not Applicable

SEQUENCE LISTING OR PROGRAM Not Applicable

BACKGROUND OF THE INVENTION--FIELD OF INVENTION

This invention pertains to rowed watercraft by facilitating direct arm-and-leg-tandem production of forward-facing rowing.

BACKGROUND OF THE INVENTION

Traditional rowing of a watercraft possesses the advantages of utilizing simple rowing apparatuses and of those rowing apparatuses being intuitively obvious and satisfactorily effec-

tive to use: With traditional oarlocks serving as fulcrums the oars function as first class levers to which the rower directly applies force by pulling on the oar handles after the oar blades have been lowered into the water. The advantages are clear enough for the basic means of traditional rowing to have been in continual use for millennia. Nevertheless, traditional rowing also possesses two obvious disadvantages. First, it propels the rower backwards, and second, it limits the force that can be applied to the oars to that which the rower can exert directly through the hands in pulling on the oar handles. Overcoming these two disadvantages, whether singly or together, has been the goal of prior inventions.

Forward-facing rowing, considered singly, was the goal of U.S. Pat. No. 5,215,482 issued Jun., 1993, to Henry; U.S. Pat. No. 5,248,272 issued Sep., 1993, to duPont; and U.S. Pat. No. 5,647,782 issued Jul., 1997, to Henry, to cite recent examples. Henry's 1993 innovation achieves forward-facing rowing while basically preserving traditional rowing technique by means of placing a direction transfer mechanism between two first class levers, allowing the first class lever on the handle end to pivot against the inside end of the other first class lever so that the blade end of the oar propels the watercraft in the opposite direction it would otherwise, which is to say, forward.[a] Henry's 1997 innovation refines, but does not simplify, his 1993 patent.[b] DuPont's 1993 innovation makes use of mechanical devices such as gears, torque shafts, looms, and a linkage assembly to accomplish forward-facing rowing.[c]

However, no prior invention employs the admittedly obvious strategy of simply reversing the rowing motion to accomplish forward-facing rowing (that is, pushing the oar handle through the stroke phase of the rowing motion, rather than pulling it through the stroke phase as in traditional rowing). The obviousness of the "solution" by itself is sufficient to explain why

no prior art claims it as an invention, but there are further reasons. One problem with simply reversing the rowing motion is that the rower can no longer use her feet to push against the hull floor as a thrust abutment in support of the rowing motion while remaining seated in a watercraft. Though by supporting the back one can provide an alternative thrust abutment for use in forward-facing rowing, making use of that strategy would decrease the power applied to the oars by removing the force which is exerted by the back in traditional rowing. Alternatively, the rower could stand, thereby sacrificing the stability of a small watercraft; or the rower could lean forward from a seated position to row, thereby creating an uncomfortable and awkward rowing posture. The simple solution creates problems as large or larger than the problem it solves. Therefore, more complicated solutions, such as those cited, have been invented.

That traditional rowing limits the force that can be applied in propelling a watercraft to that which the rower can exert directly through the hands alone has also spurred prior inventions, which have combined a strategy to add leg power to the oars with a strategy to achieve forward-facing rowing. U.S. Pat. No. 5,685,750 issued November, 1997, to Rantilla and U.S. Pat. No. 6,109,988 issued August, 2000, to Dunn, Jr., are recent examples. Rantilla's 1997 invention uses cord attachments and pulleys to transfer power from the rower to the oars.[d] Dunn, Jr.'s invention also uses pulleys and associated apparatuses to operate the oars.[e]

Again, no prior invention employs the simplest strategy, in this case adding a pedal attachment to the oars so that the rower can directly power the rowing motion with the use of the arms and legs together, instead of with the arms alone. And again, problems which arise upon considering the simple solution seemingly make it impracticable: attaching a pedal to the handle on traditional rowing apparatuses would cause transverse torquing of the oar and oar-

lock which would render the rowing ineffective and could break the oar or oarlock. Furthermore, any downward motion of the attached oar pedal, which would be needed to swing the oar blade out of the water in the recovery phase of the rowing motion, would be blocked by the hull floor, unless the boat seat were raised, in which case the boat would become unstable unless the boat were large. In that case the advantage of adding leg power would be lost in that the greater force generated would be used up, in part or whole, on moving a larger watercraft. Moreover, an attempt to adjust handles far enough back to stay within reach when the legs are extended against the pedals can cause the handles to be placed behind the rower when the rower retracts the pedals to set up the next stroke. Again, the simplest solution creates problems as large or larger than the problem it solves. Therefore, more complicated solutions, such as those cited, have been invented.

No prior art employs strategies to achieve effective forward-facing rowing by simply reversing the rowing motion. Nor does any prior art achieve arm-and-leg-tandem production of the rowing motion by directly affixing a pedal attachment to the oars.

BACKGROUND OF THE INVENTION--OBJECTS AND ADVANTAGES

The present invention has as objects and advantages:

(a) providing design solutions making effective forward-facing rowing of a watercraft possible by simply reversing the rowing motion,

(b) providing design solutions making it possible to add pedal bars and pedals directly to watercraft oars so that a rower can add force generated through the legs and feet directly to that generated through the arms and hands,

(c) to provide a recumbent seat for the rower to recline in while rowing; and

(d) to provide advantageous body mechanics to the rower by means of the recumbent seating position: as one moves the handles and pedals into place to begin the stroke phase of the rowing motion when using the present invention, one's torso is positioned relative to one's legs as when one crouches forward to stand up or crouches down to jump.

The crouch position just described above produces body mechanics by which a healthy person can generate 150-170% more force during the stroke phase of a rowing motion than is possible for the same healthy person using a racing scull. The percentage claim derives from a comparison of the power-lifting records for the two lifts--the bench press and the squat--which utilize the pushing motions used in powering the present invention through the stroke phase of the rowing motion with the one power lift--the dead lift--which utilizes the pulling motion used in rowing a racing scull (www.powerlifting.com/records).[f]

SUMMARY

With a recumbent seat positioned relative to handle-and-pedal assemblies directly attached to oars in such a way that a rower can produce maximum power for rowing a water craft, the present invention facilitates direct arm-and-leg-tandem production of forward-facing rowing.

DRAWINGS--FIGURES

FIG 1 provides a perspective view of a preferred embodiment of the present invention mounted on two hulls.

FIG 2 shows the present invention from a rear perspective view which brings structural support components into focus.

FIG 3 shows a partial perspective of the present invention depicting the starboard-side and center of the apparatus from an elevated front, port-side view.

FIG 4 shows a partial perspective of the present invention detailing the starboard side from an elevated front, starboard-side view.

DRAWINGS--Reference Numerals

10	apparatus	32	thrust abutment frame
15	hulls	34	reclined back rest
20	apparatus support structure	36	thrust abutment brace
22	starboard hull-mounted frame	40	seat
24	port hull-mounted frame	42	main seat post
26	fore connecting bar	44a	starboard seat post
28	aft connecting bar	44b	port seat post
29a	starboard support bar	50	handle-and-pedal assembly
29b	port support bar	52	handle bar
30	thrust abutment and reclined back rest	54	handle

55	assembly connecting brace	66	vertically positioned pivotal axis
56	pedal bar	68a	outer axis brace
58	pedal	68b	inner axis brace
60	pair of connected pivotal axes	70	oars
62	longitudinally positioned pivotal axis	71a	starboard oar
64a	fore axis brace	71b	port oar
64b	aft axis brace	72	oar-support spar
65a	axis cap	74	spar brace
65b	axis cap	76	oar support cable
65c	axis cap	78	blade

DETAILED DESCRIPTION--FIGS. 1, 2, 3, AND 4--PREFERRED EMBODIMENT

For a better understanding of this invention, the following description should be read with the accompanying drawings in view. In referring to this invention and the parts which it comprises, the reference numerals provided above shall be used throughout the following description. I refer now to FIG 1. There depicted is a perspective view of the preferred embodiment of the present invention as seen from above the port side of the craft and to the fore. The preferred embodiment generally, referred to as apparatus 10, is depicted attached to hulls 15. (The design of hulls 15 is not relevant beyond what is necessary to indicate that apparatus 10 is attached to a watercraft.) Apparatus 10 comprises these major components: apparatus support structure 20; a thrust abutment and reclined back rest 30; a seat 40; a handle-and-pedal assembly 50--one each to starboard and to port side; a pair of connected pivotal axes 60--one

each to starboard and to port side; and oars 70, of which a starboard oar 71a and a port oar 71b are indicated.

FIG 2 shows apparatus support structure 20 and a rear perspective of thrust abutment and reclined back rest 30: embedded in hulls 15 are a starboard hull-mounted frame 22 to the right and a port hull-mounted frame 24 to the left. Connecting starboard and port hull-mounted frames 22 and 24 are a fore connecting bar 26 and an aft connecting bar 28. Running parallel with each other and with starboard and port hull-mounted frames 22 and 24 are a starboard support bar 29a and a port support bar 29b. Starboard support bar 29a and port support bar 29b extend from fore connecting bar 26 to aft connecting bar 28; support bars 29a and 29b are centered between starboard and port hull-mounted frames 22 and 24. A reclined back rest 34 sits on starboard and port support bars 29a and 29b behind fore connecting bar 26. Reclined back rest 34 tilts back to sit at about a 45 degree angle relative to support bars 29a and 29b. A thrust abutment frame 32 attaches to starboard and port support bars 29a and 29b. Thrust abutment frame 32 holds reclined back rest 34 in place. A thrust abutment brace 36 positions thrust abutment frame 32 to set up optimal body mechanics for one using apparatus 10.

FIG 3 shows seat 40 mounted by means of a main seat post 42 to fore connecting bar 26 and by means of a starboard seat post 44a (seen better in FIG 4) and a port seat post 44b to starboard and port support bars 29a and 29b respectively. Seat 40 is angled back so that its top surface forms about a 90 degree angle with reclined back rest 34.

Shown only on the starboard side, handle-and-pedal assembly 50 comprises: a handle 54 connected by means of a handle bar 52 above and behind starboard oar 71a; a pedal 58 con-

nected by means of a pedal bar 56 to the fore and below starboard oar 71a; and a connecting brace 55, which reinforces handle-and-pedal assembly 50 between handle bar 52 and pedal bar 56.

Also on the starboard side, starboard oar 71a mounts on a vertically-positioned pivotal axis 66--which is viewed better in FIG 4 than in FIG 3--and comprises the following description. To the aft side of where oar 71a mounts on vertically positioned pivotal axis 66 an oar-support spar 72 projects to the aft of apparatus 10. Oar support spar 72 is positioned at a right angle to oar 71a. A spar brace 74 forms a hypotenuse to the right angle formed by oar 71a and oar-support spar 72. Spar brace 74 declines from the aft end of oar-support spar 72 toward a blade 78 of oar 71a. An oar-support cable 76 stretches from aft end of oar-support spar 72 to blade 78.

Exact mirror images are found on the port side of apparatus 10 both of handle-and-pedal assembly 50 on the starboard side and of starboard oar 71a (see 71b in FIG 1).

Apparatus 10 is sufficiently disclosed by now to explain a crucial design feature. The backward tilt to thrust abutment and reclined back rest 30 does more than provide comfort and set up advantageous body mechanics for one who rows apparatus 10. Without a backward tilt to major component 30, placing handle 54 above and behind pedal 58 on handle-and-pedal assembly 50, to a degree amenable with normal human anatomy, would cause handle 54 to be positioned behind back rest 34 when pedal 58 is retracted. Apparatus 10 would thus be rendered useless. Apparatus 10 cannot be used effectively without thrust abutment and reclined back rest 30. Therefore, the backward tilt to thrust abutment and reclined back rest 30 is essential to the design structure of the present invention.

FIG 4 shows a longitudinally positioned pivotal axis 62 attached to starboard hull-mounted frame 22 in front of fore connecting bar 26. Connected at a right angle to, and centered on longitudinally positioned pivotal axis 62, is vertically positioned pivotal axis 66. A fore axis brace 64a and an aft axis brace 64b reinforce vertically positioned pivotal axis 66. Fore axis brace 64a extends from an axis cap 65a to a position just below starboard oar 71a on axis 66. Aft axis brace 64b extends from an axis cap 65b to a position just opposite where fore axis brace 64a connects to vertically positioned pivotal axis 66. Oar 71a mounts on axis 66 just above fore and aft axis braces 64a and 64b. An outer axis brace 68a extends from a position on axis 66 above oar 71a to a position just beyond axis 66 on oar 71a to the outboard side. An inner axis brace 68b extends from a position on axis 66 above oar 71a to a position on the inboard side of axis 66 on oar 71a. An axis cap 65c secures oar 71a on axis 66. A mirror image of the pair of connected pivotal axes 60, exactly as described on the starboard side except for being a mirror image, is found on the port side of the present invention.

Operation--FIGS 1, 2, 3, and 4

One rows apparatus 10 while sitting in seat 40 with one's back supported by thrust abutment and reclined back rest 30 and using, to both starboard and port sides, handle 54 and pedal 58 of handle-and-pedal assembly 50 components attached to oars 70. Everyone familiar with the art of rowing a boat knows the rowing motion used in traditional rowing. Therefore, it is sufficient to describe the use of apparatus 10 to say: With one's hands and feet used together to operate the handle-and-pedal assembly 50 components on both the starboard and port sides, one moves oars 70 through the same basic trajectory taken by oars in the course of traditional rowing. The

only substantial difference is that oars 70 are pushed through the stroke phase of the rowing motion, rather than pulled, and accordingly, they are pulled into place to begin the next stroke--rather than pushed as is the case in traditional rowing. Because one reverses the direction of the oars in using apparatus 10 relative to the movement of the oars in traditional rowing, one also reverses the direction one travels in a rowboat relative to traditional rowing: from backwards to forwards. The operation of the present invention thereby facilitates direct arm-and-leg-tandem production of forward-facing rowing of a watercraft.

Conclusion, Ramifications, and Scope

The preferred embodiment of the present invention is depicted mounted on two hulls (a catamaran). A small single-hulled rowboat would not allow for moving the pedals downward, as is necessary in the recovery phase of the rowing motion, unless the rower were seated higher than is usual in the watercraft. Sitting higher above the hull, however, would adversely affect the stability of a small watercraft. Alternatively, a single-hulled watercraft could be made large enough for the loss of stability to be negligible, in which case the greater size of the boat would offset some of the advantages afforded by the present invention. Nevertheless, circumstances can easily be imagined which would call for a larger hull or hulls than those represented in the ideal embodiment. Examples include building a craft for two or more rowers or designing a cargo-carrying craft, in which case the larger hull or hulls would not constitute a disadvantage for the present invention. However, that the present invention does not present alternative embodiments depicting it adapted for a larger hull or for an alternatively shaped hull or hulls clearly does not limit the scope of the present invention to use with a small, two-hulled water

craft: The possibility of using the present invention with many different hull configurations is obvious.

The present invention also shows fixed handle-and-pedal assemblies with fixed bar angles and bar lengths set up for the handle bars and pedal bars. (A prototype of the present invention works well with rowers ranging in height from 5′0″ to 6′5″.) Though at some time in the future it might be desirable to make bar angles and bar lengths adjustable, so that exceptionally tall or short adults can operate the present invention more effectively, simply adding means for making such adjustments would constitute obvious, not innovative, additions.

It is clear by now that the present invention makes it possible to produce forward-facing rowing with direct arm-and-leg-tandem production of the rowing motion. The design of the present invention also has secondary benefits: It provides reclining comfort and advantageous body mechanics to the person using it. Thus, the present invention provides substantial benefits over prior art means of rowing a watercraft, which a person who would enjoy a better way to row a watercraft will want to consider.

Yet a nearly limitless number of design adaptations could be made to the present invention as depicted in the preferred embodiment. Changes might be made to accommodate the present invention to different rowers with different needs or desires or with different ends in mind: whether aesthetic in nature or manufacturing related or sporting related or job related or marketing related, etc. Specific possibilities are endless, and therefore impossible to list. It is clear, however, that any design which diverges from the present invention in some detail or details but makes use of the basic design claimed herein utilizes the present invention.